

FIGURE 1

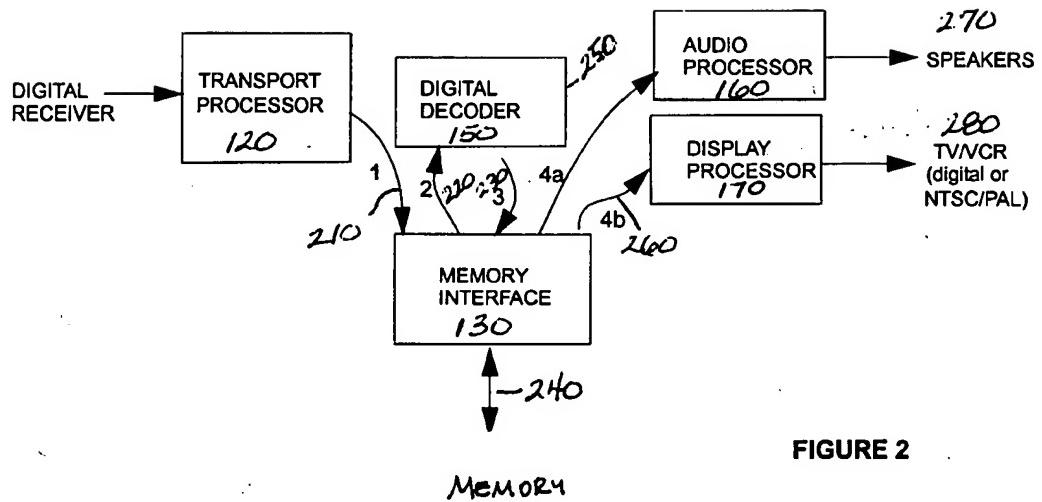


FIGURE 2

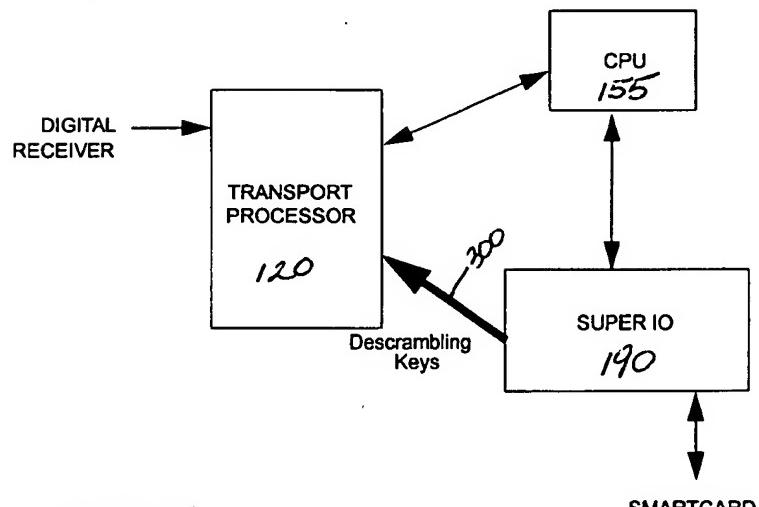


FIGURE 3

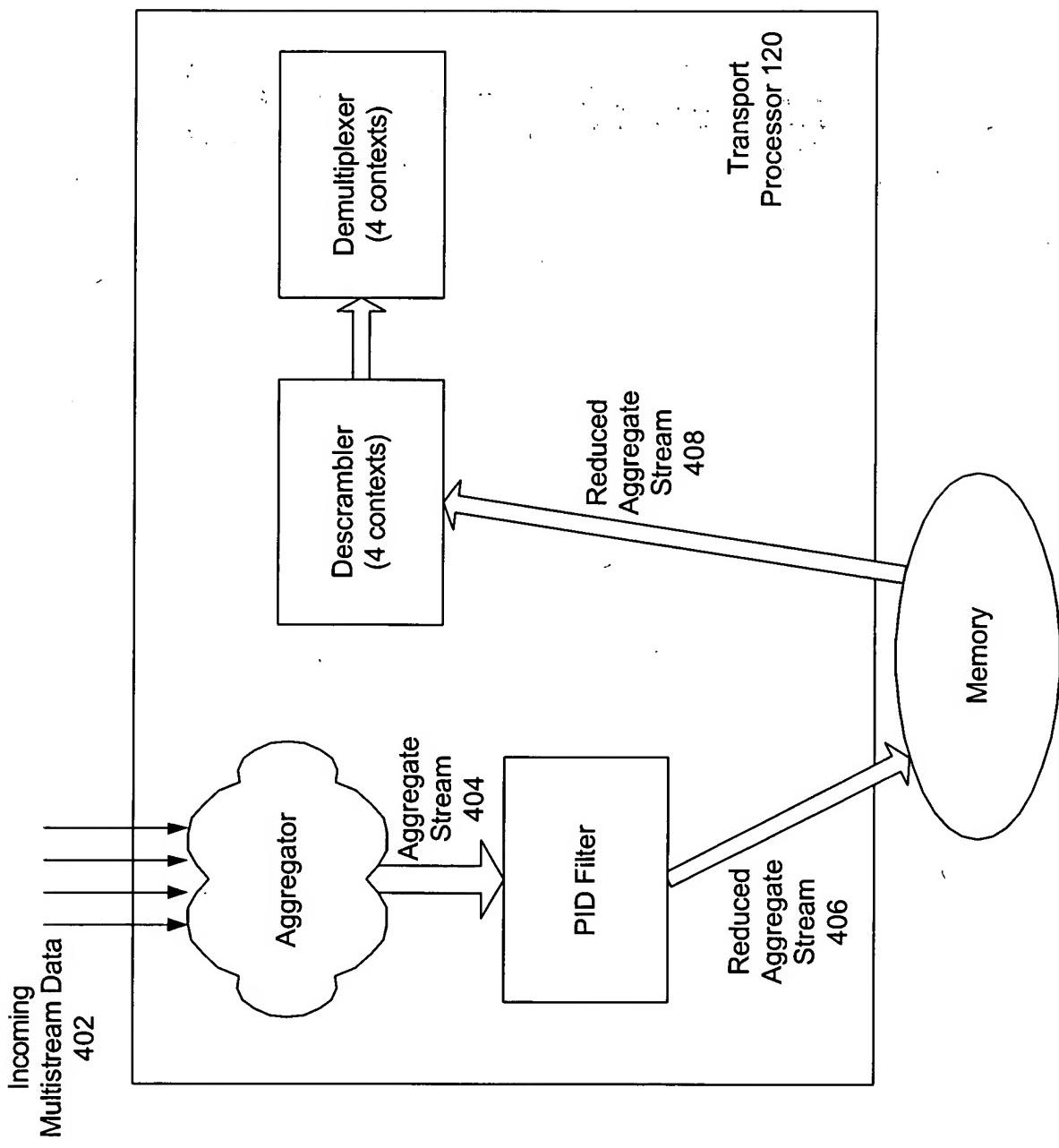


Fig. 4A

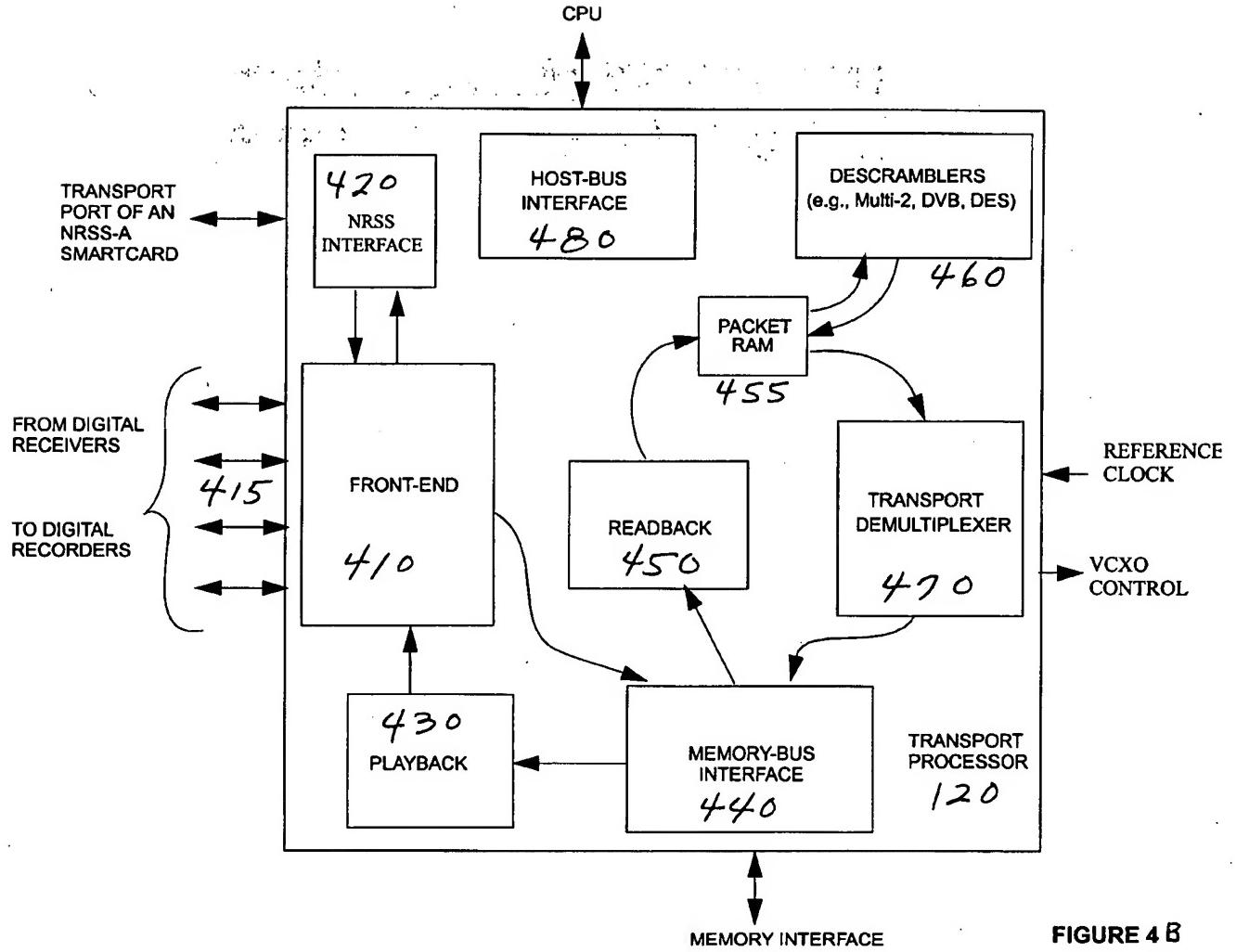
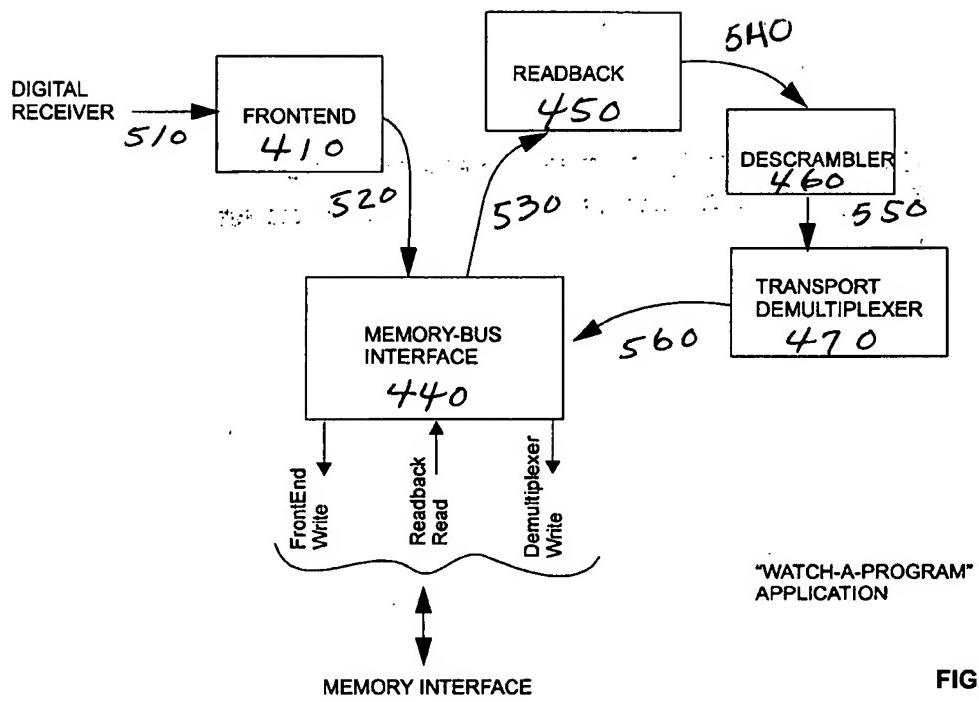
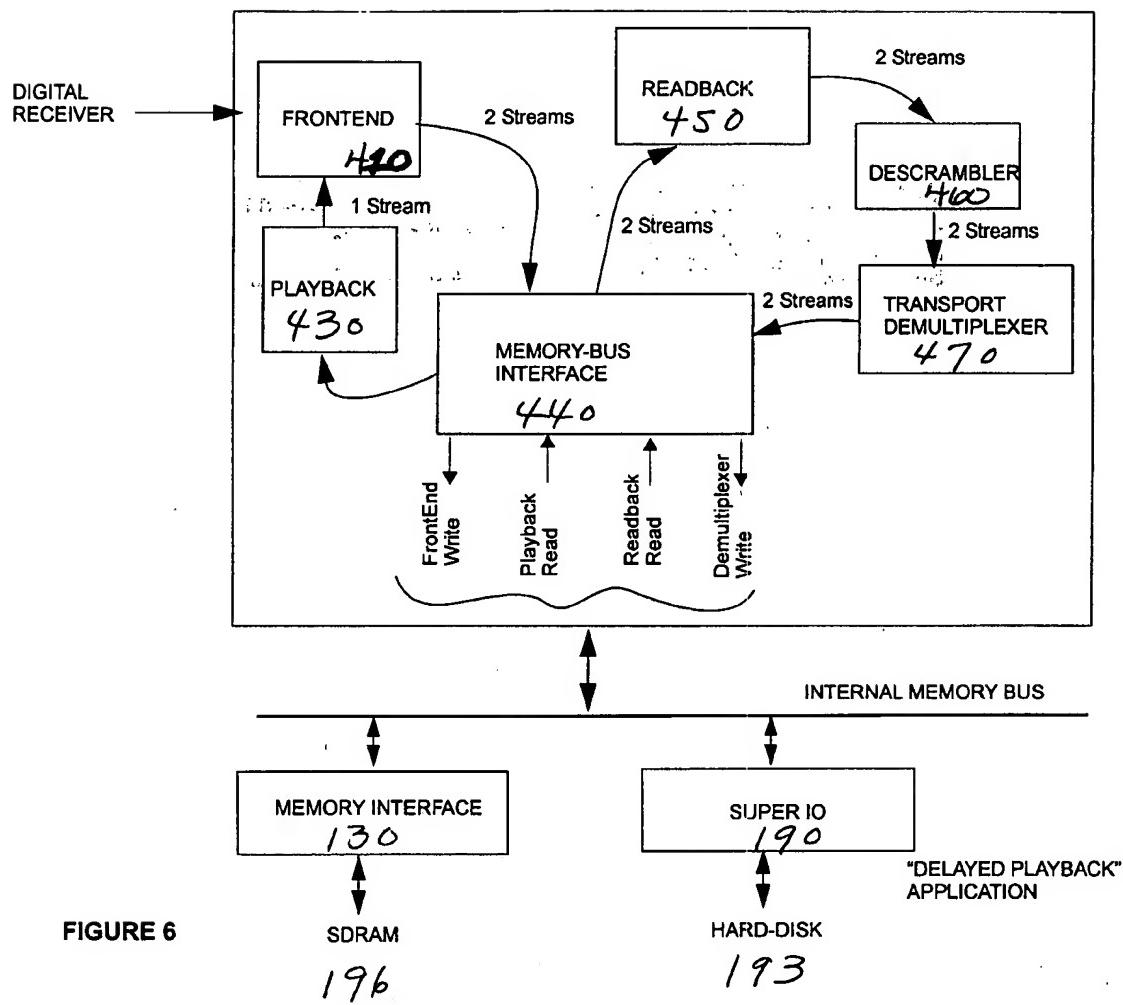


FIGURE 4 B



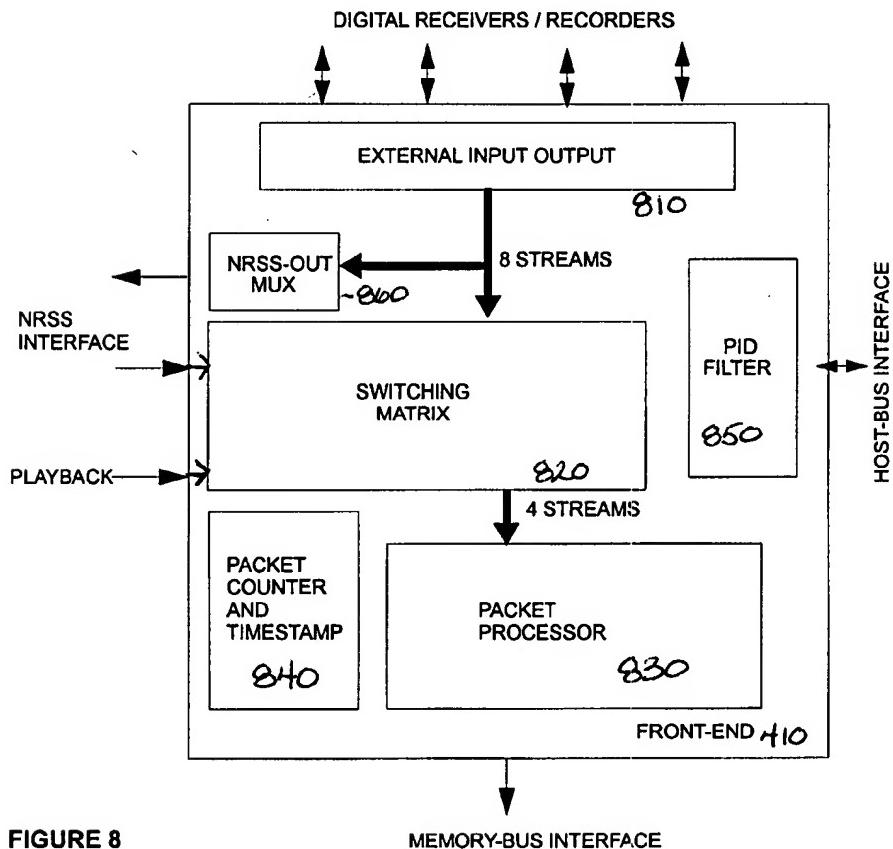
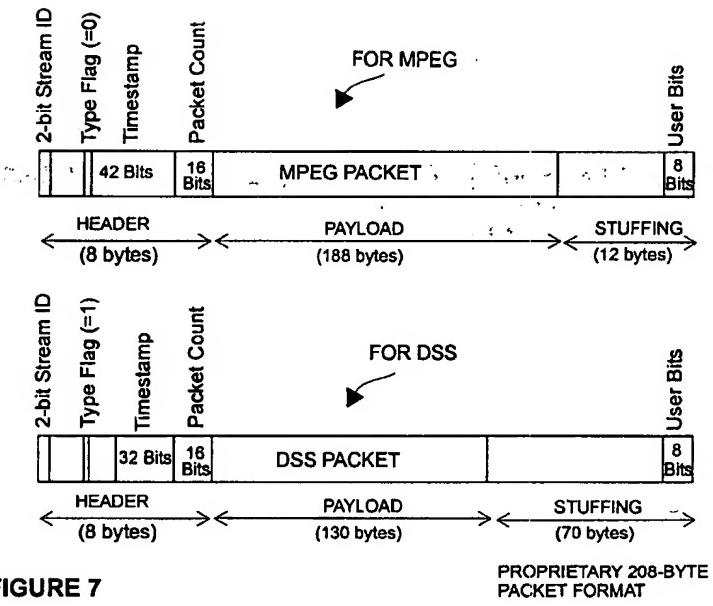
**FIGURE 5**



**FIGURE 6**

**196**

"DELAYED PLAYBACK"  
APPLICATION



**FIGURE 8**

**MEMORY-BUS INTERFACE**

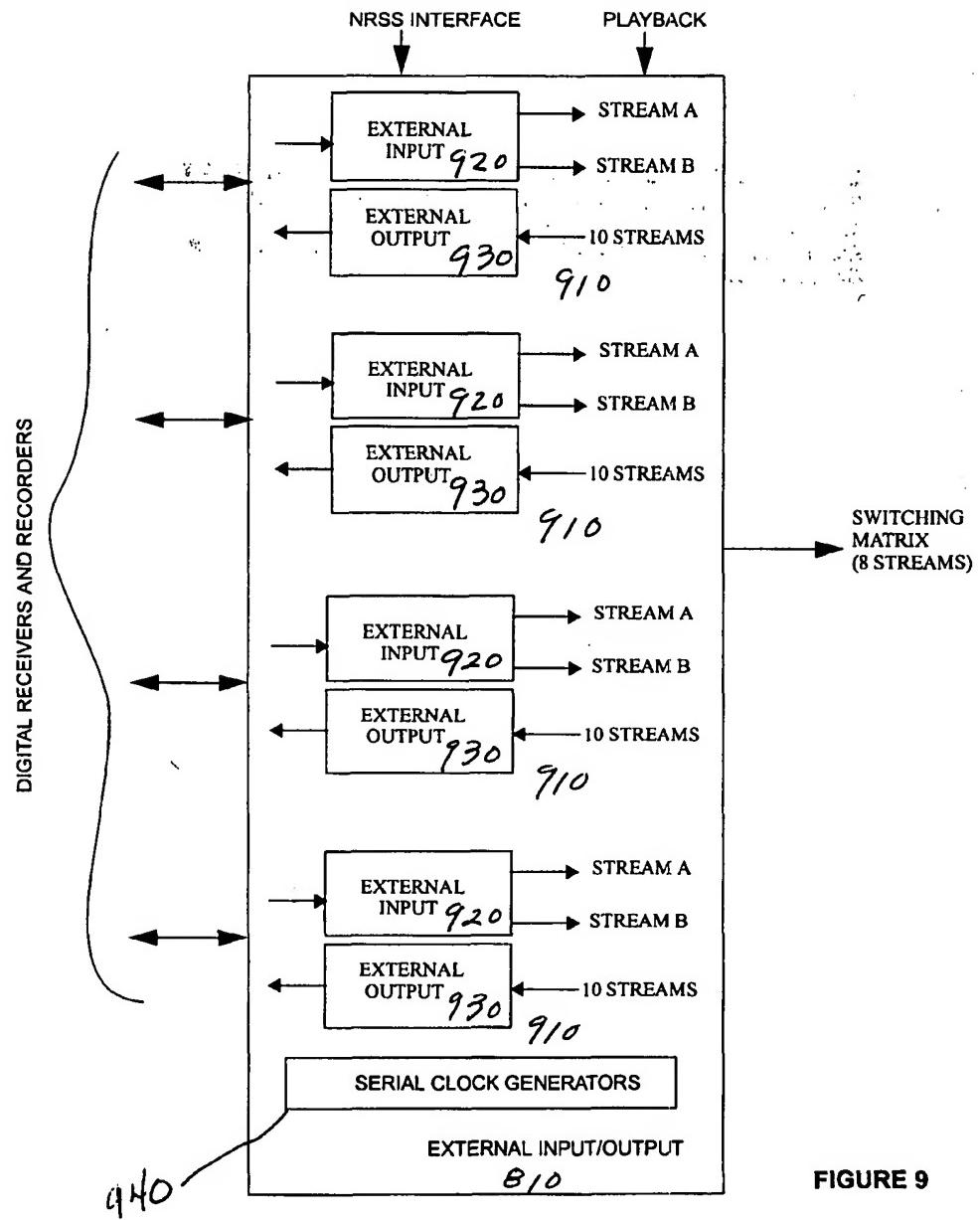


FIGURE 9

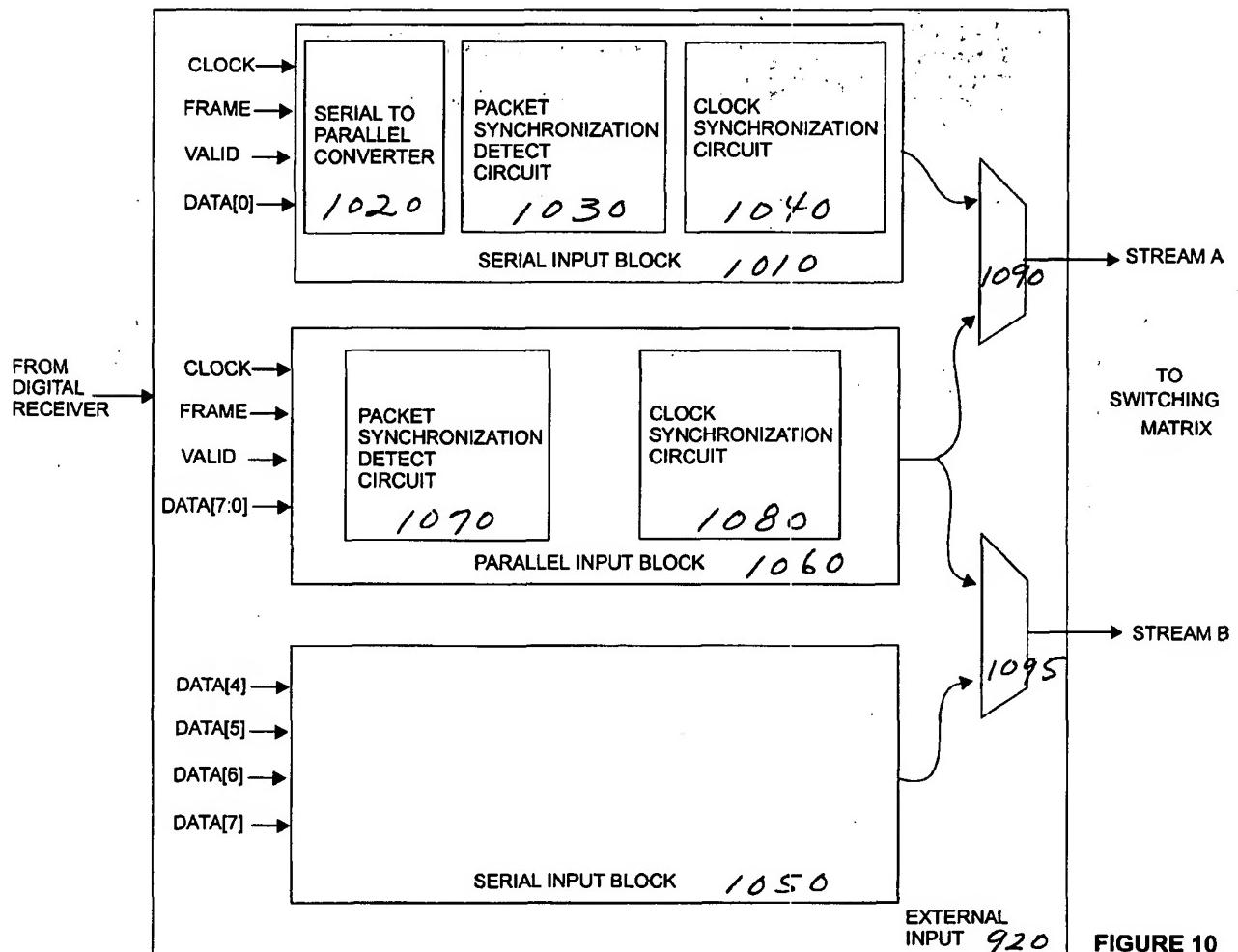


FIGURE 10

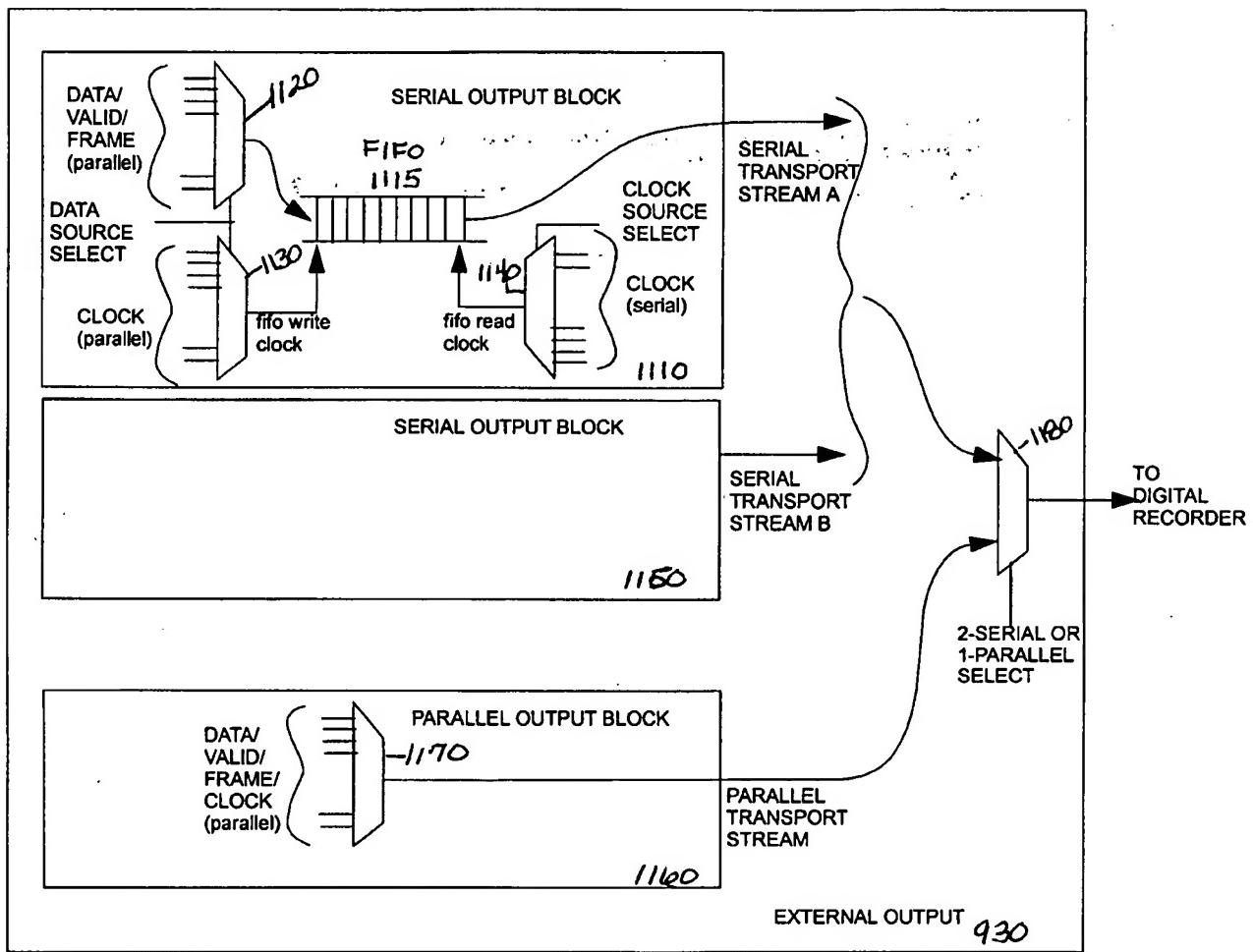


FIGURE 11

SWITCHING MATRIX

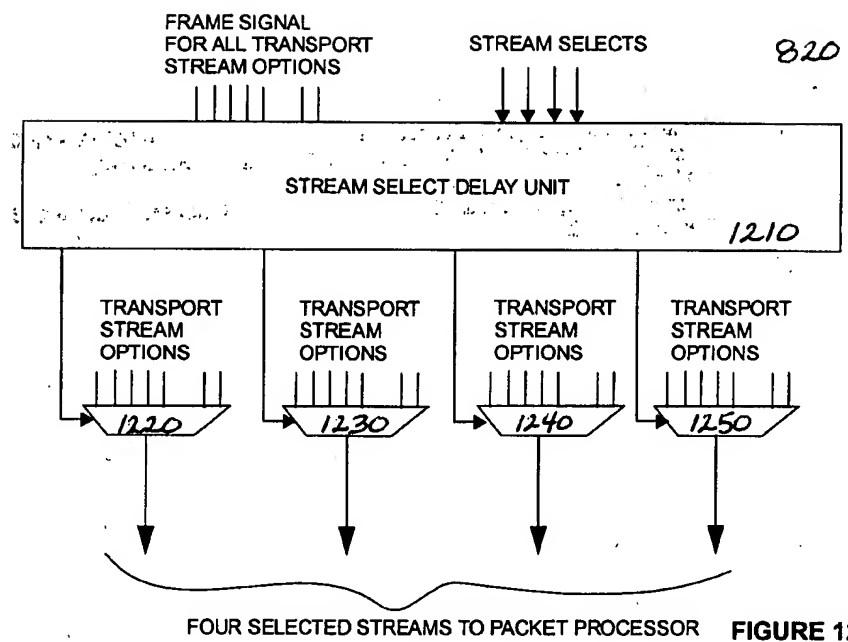


FIGURE 12A

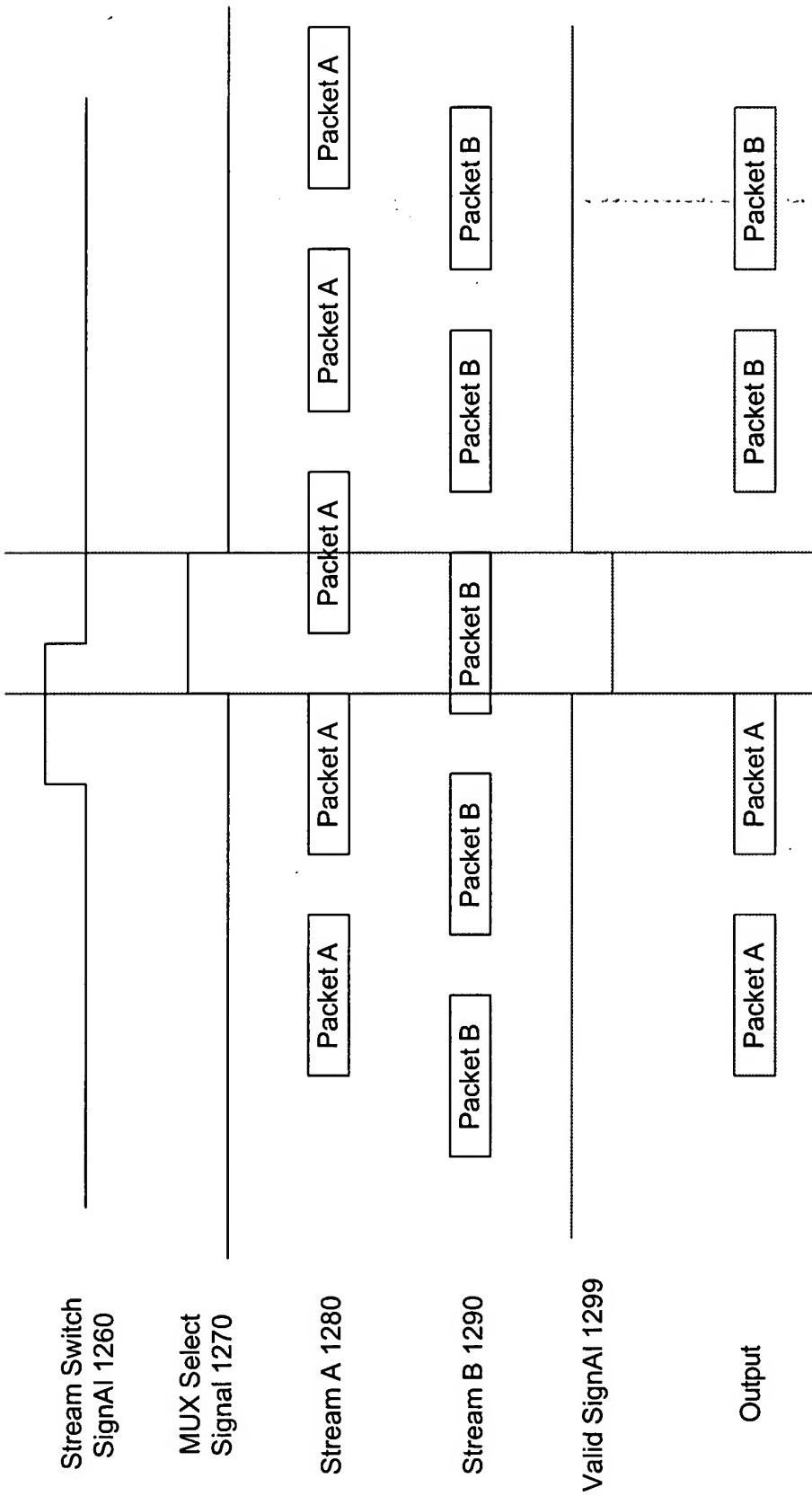


Fig. 12B

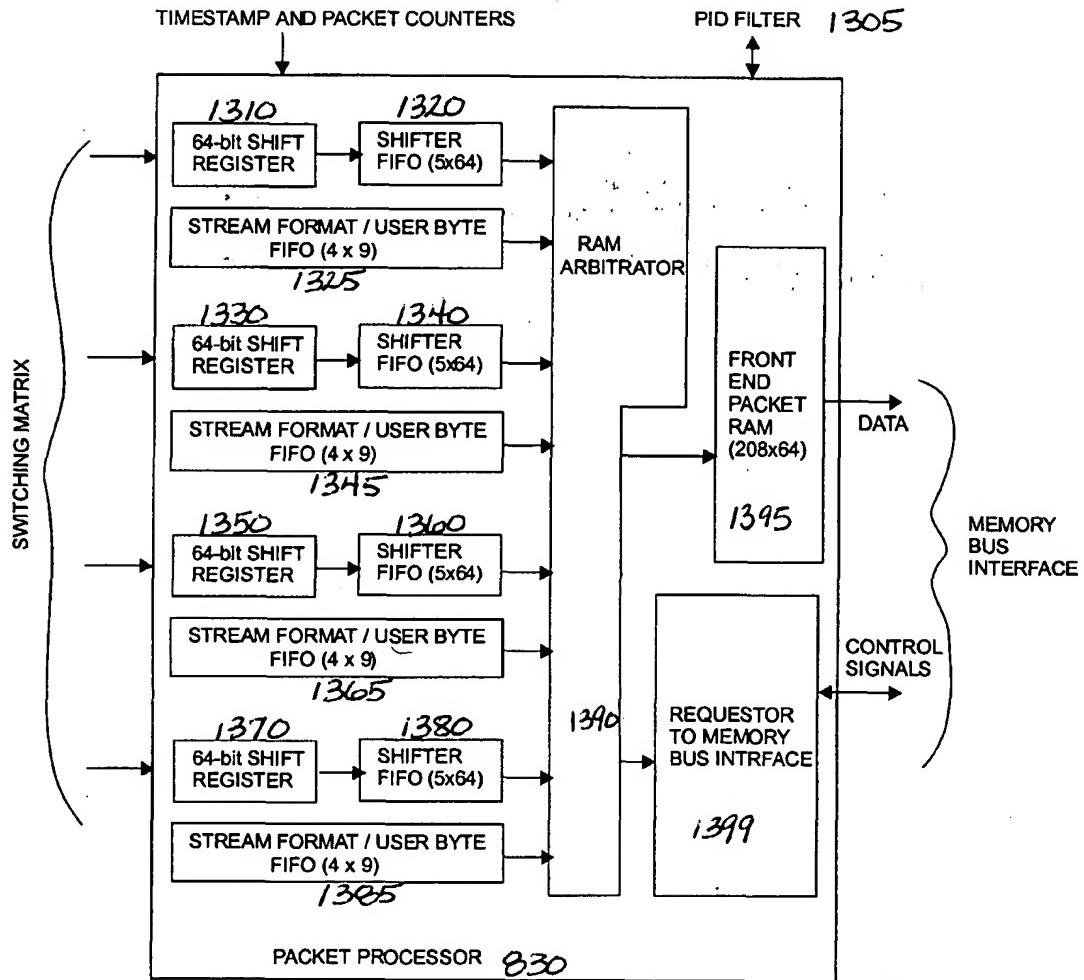


FIGURE 13

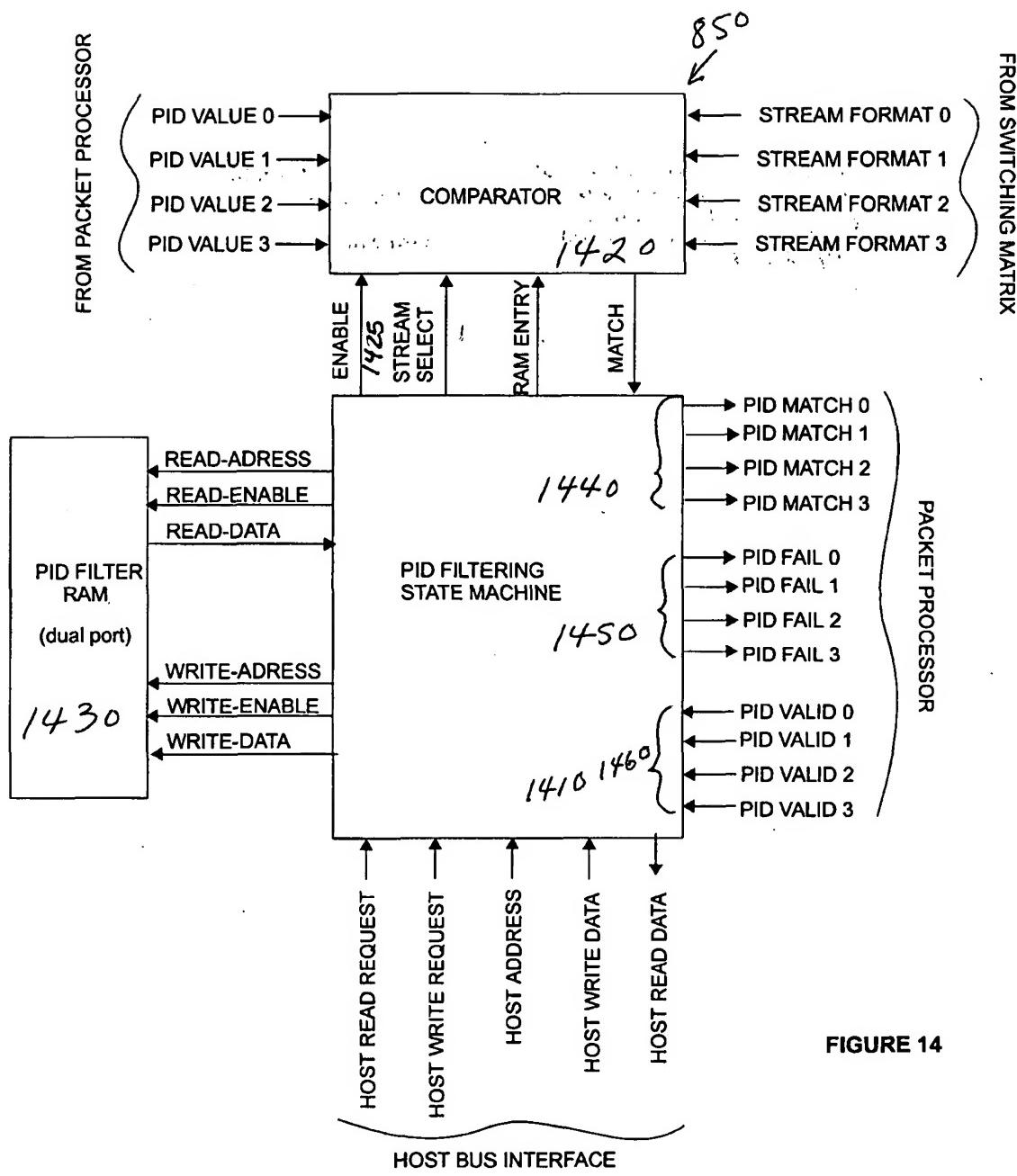


FIGURE 14

## FULL TRANSPORT: PLAYBACK RUNNING AT CONSTANT KNOWN RATE

1510

□□□□□ □□□□□ □□□□□ □□□□□ □□□□□ □□□□□ □□□□□ □□□□□

## PARTIAL TRANSPORT: PLAYBACK RUNNING IN TIMESTAMP-PER-PACKET MODE

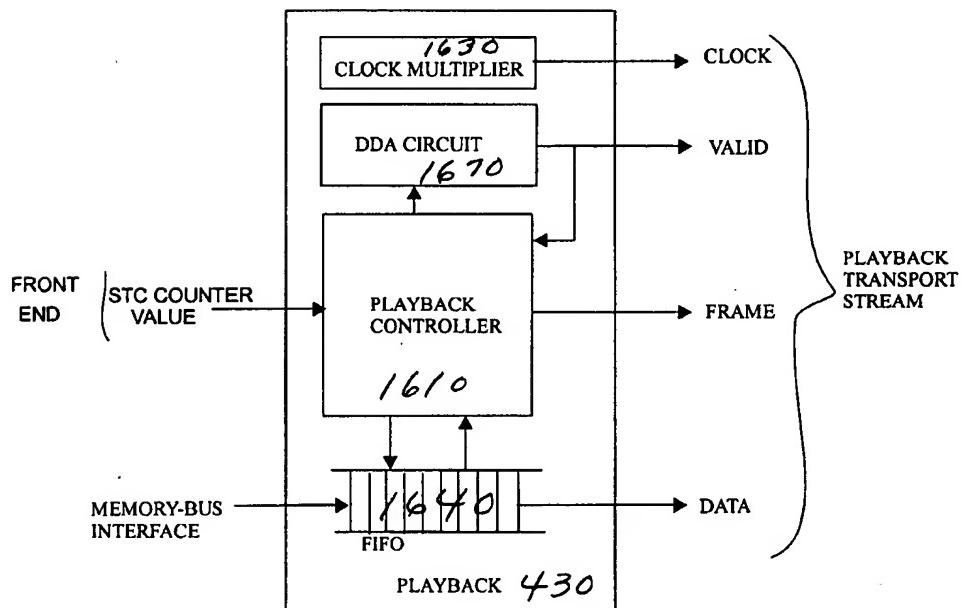
1520

## PARTIAL TRANSPORT: PLAYBACK RUNNING IN TIMESTAMP-PER-CHUNK MODE

1530

FIGURE 15

• 100 •



**FIGURE 16**

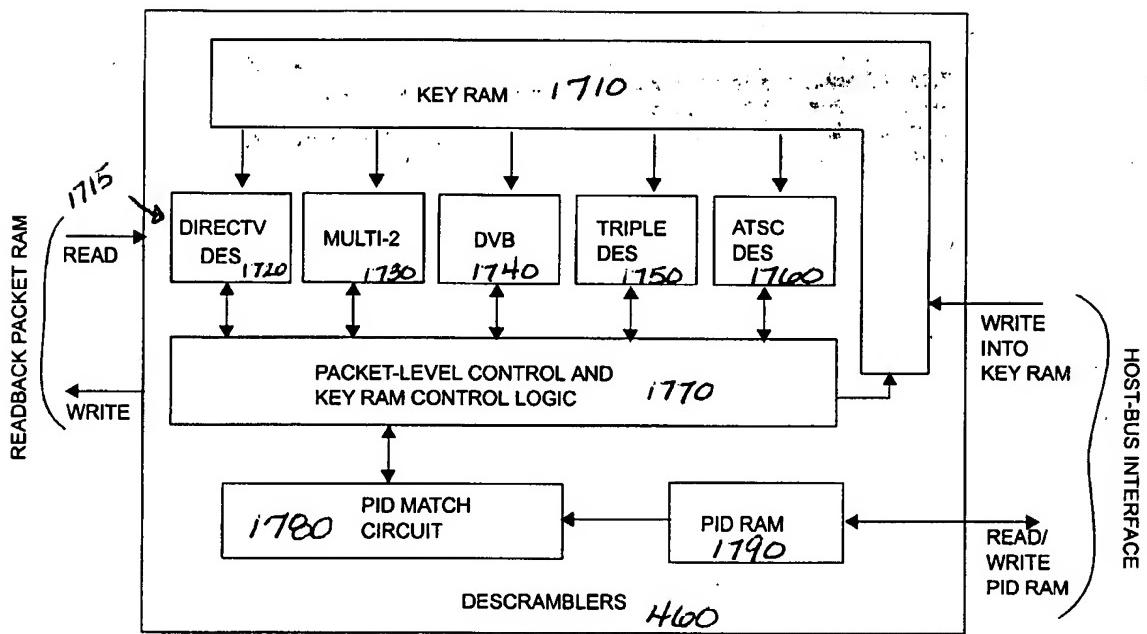


FIGURE 17

*Throughput of the Descrambling Algorithms*

<u>Descrambling Algorithm</u>	<u>#cycles per 8 bytes</u>	<u>Thruput 108 MHz</u>	<u>Thruput 150 MHz</u>	<u>Thruput 180 MHz</u>
		(in Mbps)	(in Mbps)	(in Mbps)
Multi-2	36	192	267	320
DSS DES-ECB	28	247	343	411
DVB	65	106	148	177
MPEG DES-ECB	28	247	343	411
Triple-DES CBC	72	96	133	160

*Number of Streams That Can be Descrambled For Different Broadcasts*

<u>Broadcast Type</u>	<u>Algorithm Required</u>	<u>Strm Rate</u>	<u>#Strms Descr</u>	<u>#Strms Descr</u>	<u>#Strms Descr</u>
		(Mbps)	108 MHz	150 MHz	180 MHz
Europe DVB*	DVB	60	[REDACTED]	[REDACTED]	[REDACTED]
Terrestrial US	Triple DES	19.4	4.9	6.9	8.2
DirecTV US	DSS DES	38.8	6.4	8.8	8.8
DirecTV Japan**	DVB	40	[REDACTED]	[REDACTED]	4.4
ARIB BS4 Japan	Multi-2	28.04	6.8	9.5	9.5
ATSC Cable**	Triple DES	38.8	[REDACTED]	[REDACTED]	4.1
Echostar US	DVB	24	4.4	6.2	7.4

\* 60 Mbps contains close to 10 programs, out of which we would descramble 2 or 3. So the effective rate is more like 20 Mbps.

\*\* Likewise for these cases as well, a stream is packed with numerous programs, and we would descramble only a few.

*Number of Streams That Can be Descrambled For Different Broadcasts*

<u>Descr Algorithm</u>	<u>#StdDefnPgms Descr</u>			<u>#HIDefnPgms Descr</u>		
	<u>108 MHz</u>	<u>150 MHz</u>	<u>180 MHz</u>	<u>108 MHz</u>	<u>150 MHz</u>	<u>180 MHz</u>
Multi-2	32	44	53	10	14	17
DSS DES	41	57	69	13	18	21
DVB	18	25	30	6	8	9
MPEG DES	41	57	69	13	18	21
Triple-DES	16	22	27	5	7	8

Note: For this table we assume SD-Rate=6Mbps/program  
HD-Rate=19.2Mbps/program

**FIGURE 18**

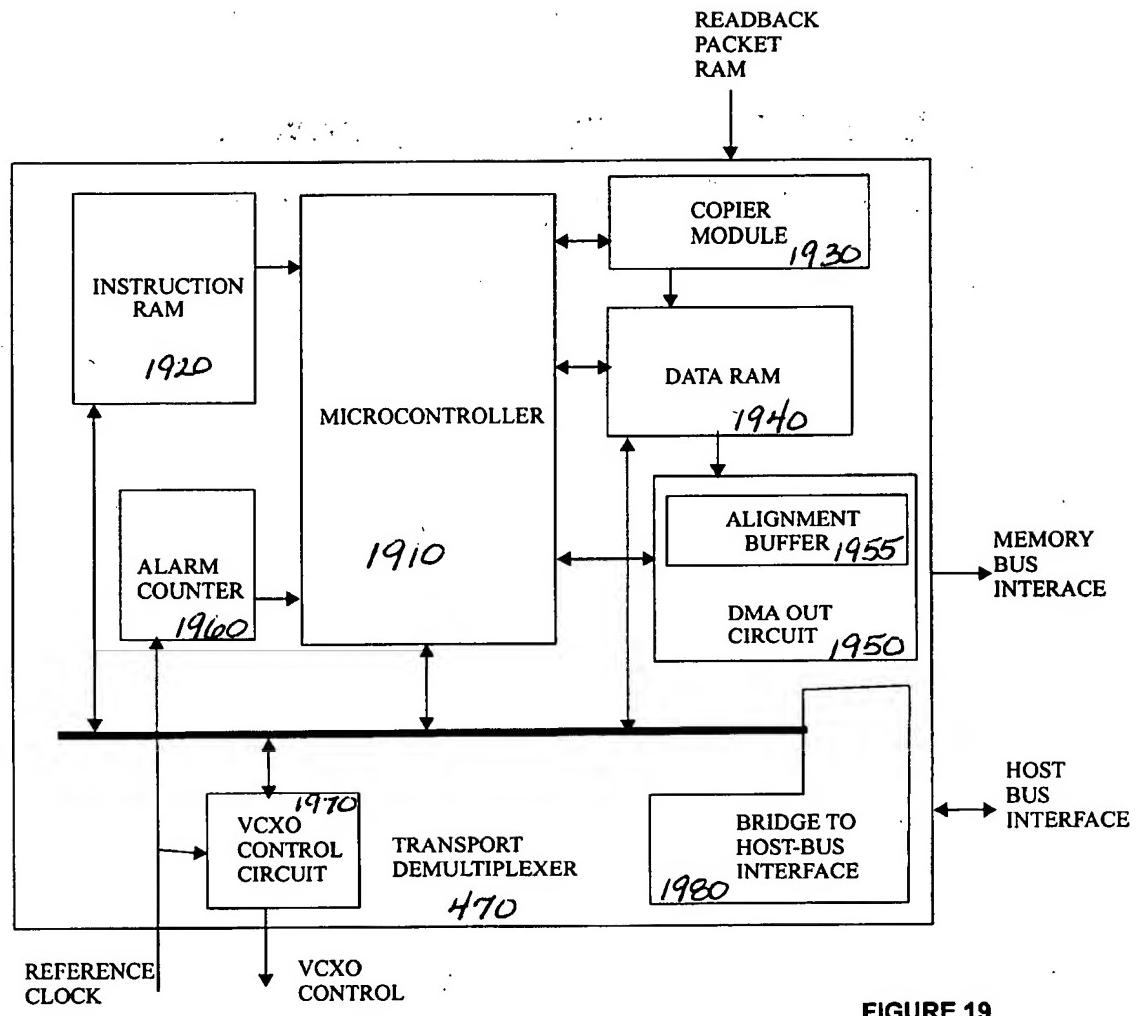
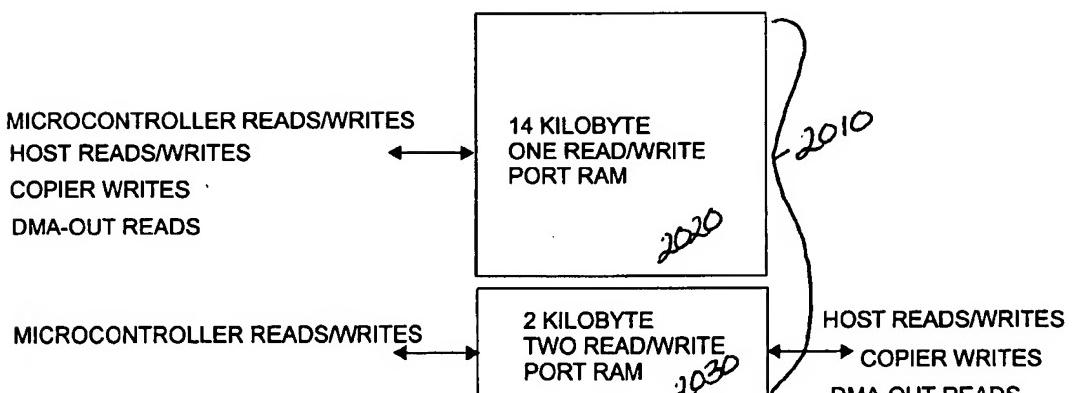
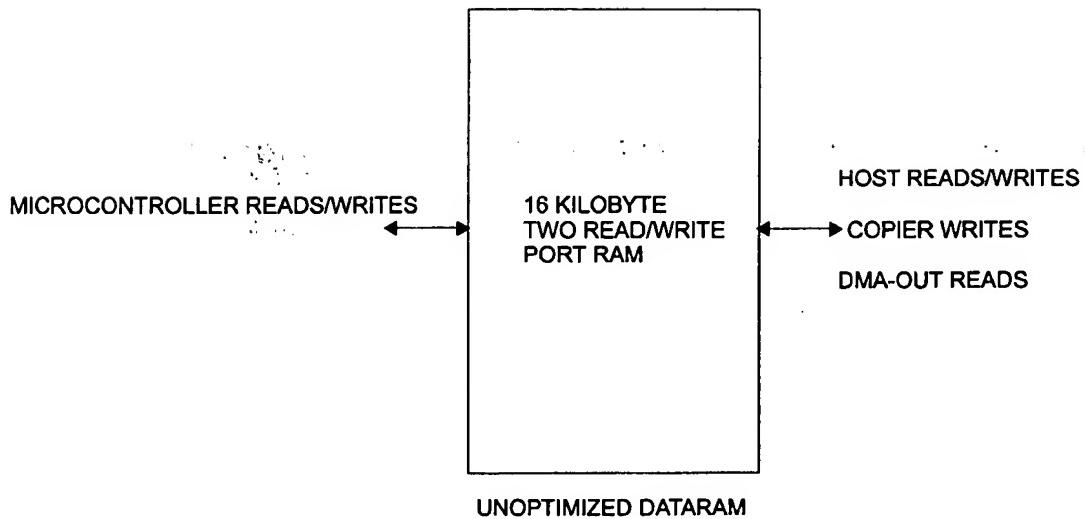


FIGURE 19



**FIGURE 20**

OPTIMIZED DATARAM